

WE CLAIM:

1 ~~Sub 1.~~ A frequency analyzer for analyzing a plurality of input signals
 2 $x_0(m) \dots x_r(m) \dots x_{M-1}(m)$, the frequency analyzer comprising:
 3 a plurality of input modulators for modulating said input signals $x_0(m) \dots x_r(m) \dots$
 4 $x_{M-1}(m)$, defining shifted output signals.
 5 a polyphase filter network which includes a plurality of polyphase filters
 6 $p_0(m) \dots p_p(m) \dots p_{M-1}(m)$ for receiving said shifted output signals and defining polyphase filter
 7 output signals; and
 8 a plurality of output modulators for modulating the output of said polyphase filters.

1 2. The frequency synthesizer as recited in claim 1, wherein said input modulators
 2 includes means for multiplying said input signals $x_0(m) \dots x_r(m) \dots x_{M-1}(m)$ by a factor $e^{j2\pi k_0 m}$,
 3 where k_0 is a selectable odd/even stacking factor.

1 3. The frequency synthesizer as recited in claim 1, wherein said output modulator
 2 includes means for multiplying said polyphase filter output signals by a factor $e^{-j2\pi k_0 p/M}$, where
 3 k_0 is a suitable odd/even stacking factor and p is the channel, and M is total number of
 4 channels.

1 4. A polyphase filter comprising:
 2 a plurality of filter channels,

$$\bar{p}_0(m) \dots \bar{p}_p(m) \dots \bar{p}_{M-1}(m)$$

4 for filtering a plurality of input signals $x_0(m) \dots x_r(m) \dots x_{M-1}(m)$
 5 a complex modulator, which modulates each input signal $x_0(m) \dots x_p(m) \dots x_{M-1}(m)$ by
 6 a factor $(-1)^m$, where m is the time index; and
 7 a plurality of output modulators for modulating each of the outputs of said plurality
 8 filter channels by a modulation factor.

1 5. The polyphase filter as recited in claim 4, wherein said complex modulation
 2 factor is $e^{-j2\pi k_0 p/M}$, where k_0 is a selectable odd/even stacking factor, p is the channel and M is the

3 number of channels.

1 6. A complex modulator for generating a signal $(-1)^m$, where m is a time index, the
2 modulator comprising:

3 a multiplexer adapted to receive an input signal I_N at one input and an inverted
4 input at another input;

5 an AND gate having at least two inputs and an output, said output for controlling
6 said multiplexer; and

7 a divider for dividing a clock signal by two defining a divided signal, said divided
8 signal applied to one input of said AND gate;

9 wherein said AND gate is adapted to receive an odd/even stacking factor k_o at the
10 other of said inputs of said AND gate.

1 7. The frequency analyzer as recited in claim 1, wherein said input modulators
2 include an inverter and a one more multiplexers for receiving one or more compensation
3 vectors for selectively negating said input signals.

1 8. A frequency synthesizer for synthesizing a plurality of input signals
2 $x_0(m) \dots x_r(m) \dots x_{M-1}(m)$, the frequency synthesizer comprising:

3 a plurality of input modulators for modulating said input signals

4 $x_0(m) \dots x_r(m) \dots x_{M-1}(m)$, defining shifted output signals.

5 a polyphase filter network which includes a plurality of polyphase filters

6 $p_0(m) \dots p_p(m) \dots p_{M-1}(m)$ for receiving said shifted output signals and defining polyphase filter
7 output signals; and

8 a plurality of output modulators for modulating the output of said polyphase filters.

1 9. The frequency synthesizer as recited in claim 8, wherein said input modulators
2 include an inverter and a one more multiplexers for receiving one or more compensation
3 vectors for selectively negating said input signals.